

CLAIMS

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1. A device for determining information about the repetitive movement of a human body, the device comprising:

a sensor assembly comprising at least one static acceleration sensor configured to be mounted to the human body and to generate at least one static acceleration signal; and a processor coupled to the sensor assembly and configured to determine at least one from among a movement identification, a movement count, a movement pattern, and a breathing pattern in response to the at least one acceleration signal.

2. A device for determining and displaying information about the repetitive movements of a human body, the device comprising:

a sensor assembly comprising a first acceleration sensor and a second acceleration sensor configured to be mounted to the human body and to generate first and second acceleration signals in response to movement of the human body; and a processor and display device coupled to the sensor assembly and configured to provide a real-time, continuous display of a movement pattern of a selected area of the human body in response to the first and second acceleration signals.

3. The device of claim 2 wherein the processor and display device are also configured to display the movement pattern for each arm of the human body.

4. The device of claim 2 wherein the processor and display device are also configured to display the breathing pattern of the human body.

5. A device for determining and displaying information about the repetitive movements of a swimmer's body, the device comprising:

a sensor comprising a two-axis accelerometer configured to be mounted to the swimmer's body and to generate first and second signals in response to movement of selected areas of the swimmer's body;

a processing circuit coupled to the sensor and configured to receive the first and second signals and to determine the swimmer's stroke pattern and breathing pattern in response to the first and second signals; and

a display device for providing a real-time, continuous display of the swimmer's stroke pattern and breathing pattern.

6. The device of claim 5 wherein the processor is configured to determine the swimmer's stroke pattern, and the display device is configured to display the stroke pattern, the stroke pattern comprising at least a stroke count.

7. The device of claim 6 wherein the processor is configured to determine the swimmer's kick pattern, and the display device is configured to display the swimmer's kick pattern, the kick pattern comprising at least one kick count.

8. The device of claim 5 wherein the processing circuit is configured to determine the swimmer's breathing pattern, and the display device is configured to display the swimmer's breathing pattern.

9. The device of claim 5 wherein the accelerometer is positioned to detect the angle of a first axis parallel to the direction of travel of the swimmer's body and the angle of a second axis, which is perpendicular to the first axis, with respect to a vertical axis.

10. The device of claim 5 wherein the first and second axes are positioned parallel to the surface of the earth.

11. The device of claim 5 wherein the swimmer's stroke pattern comprises a stroke count, the starting of swimming, the stopping of swimming, and turns to reverse course.

12. A device for determining and communicating information about the repetitive movements of a swimmer's body, the device comprising:

a sensor assembly configured for mounting to the swimmer's body and comprising a first accelerometer positioned to detect rolling motion of the swimmer's body about a longitudinal axis of the swimmer's body that is parallel to the direction of travel of the swimmer's body, and a second accelerometer that is positioned to detect tilting movement of the swimmer's body about an axis that is perpendicular to the longitudinal axis;

a processor coupled to the sensor and configured to provide real-time, continuous signals identifying at least the swimmer's stroke type and the swimmer's stroke pattern;

means for transmitting the real-time, continuous signals from the processor; and

a communication device configured to receive the real-time, continuous signals from the transmitting means and to communicate at least the swimmer's stroke type and stroke pattern.

13. The device of claim 12 wherein the transmitting means comprise at least one bus to convey data from the processor to the communication device.

14. The device of claim 12 wherein the transmitting means comprise a radio frequency transmitter for transmitting signals from the processor to the communication device.

15. The device of claim 12 wherein the communication device comprises an earpiece coupled to the processor via the transmitting means and configured to generate audible sounds corresponding to at least the swimmer's stroke type and stroke pattern.

16. The device of claim 12, wherein the transmitting means is configured to transmit signals from the sensor assembly to the processor.

17. A device for monitoring repetitive movement of a human body, comprising:

a sensor assembly configured to be mounted to the human body and to generate signals corresponding to acceleration of the human body about a first axis that is parallel to the direction of travel of the human body and a second signal corresponding to acceleration about a second axis that is perpendicular to the first axis;

a processor configured to receive the first and second signals and to determine at least a movement type and a movement pattern of the human body therefrom; and

a display device coupled to the processor and configured to display at least the movement type and the movement pattern.

18. The device of claim 17 wherein the display device is configured to display real-time, continuous information regarding the movement type and movement pattern.

19. The device of claim 17, comprising an audio device coupled to the processor and configured to generate audible sounds corresponding to at least the movement type and the movement pattern.

20. A device for monitoring repetitive movement of a human body the device comprising:

a sensor apparatus configured to be mounted to the human body and to generate first and second signals corresponding to acceleration about first and second axes, respectively; and

a processor and output device configured to receive the first and second signals and to output real-time, continuous information corresponding to the first and second signals, including an identification of the movement patterns and variations in the movement patterns over time.

21. The device of claim 20 wherein one of the movement patterns comprises the breathing pattern of the human body.

22. The device of claim 20 wherein the movement patterns comprise at least stroke count, starting of swimming, stopping of swimming, and turning movements to change course.

23. The device of claim 20, comprising an audio device coupled to the processor and configured to generate audible sounds corresponding to at least the movement type and the movement pattern.

24. A method for monitoring repetitive movement of a human body, the method comprising:

mounting first and second accelerometers to the human body, the first accelerometer mounted along a first axis that is parallel to the direction of movement of the human body, the second accelerometer mounted along a second axis that is perpendicular to the first axis, the first and second accelerometers configured to generate signals corresponding to variations in the position of the first and second accelerometers with respect to a vertical axis;

receiving the signals from the first and second accelerometers in response to movement of the human body about the first and second axes and processing the signals to determine the identification of the movement of the human body about the first and second axes and the changes in the movement over time.

25. A method for monitoring repetitive movement of a swimmer's body, the method comprising:

mounting a sensor assembly to the swimmer's body to detect and track movement of the swimmer's body about a first axis parallel to the direction of travel of the swimmer's body and movement of the swimmer's body about a second axis that is perpendicular to the first axis, both with respect to a vertical axis, and generating first and second signals therefrom;

receiving and processing the first and second signals to determine at least variations in the swimmer's stroke pattern over time; and

providing a real-time, continuous observable output of at least the variations in the stroke pattern.

26. The method of claim 25, further comprising receiving and processing the first and second signals to determine the swimmer's breathing pattern and providing a real-time, continuous display of the swimmer's breathing pattern.

27. The method of claim 25, further comprising receiving and processing the first and second signals to determine the swimmer's kicking pattern, and providing a real-time, continuous display of the swimmer's kicking pattern.

28. The method of claim 25 wherein comprising providing an audible signal corresponding to the swimmer's stroke pattern.

29. The method of claim 25 wherein the swimmer's stroke pattern comprises at least one from among periodicity, stroke count, start and stop of stroke, and stroke elapsed time.

30. A method for monitoring repetitive movement, comprising:
sensing repetitive movement of a selected area of the human body about first and second axes with respect to a vertical axis and generating first and second acceleration signals;
processing the first and second signals using peak detection techniques and auto-correlation techniques to identify movement count, movement type, and to provide a display signal; and

receiving the display signal and displaying a repetitive movement pattern corresponding to each of the first and second signals.